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Wood As Energy

An Overview: Wood as an Alternative Home Heating Fuel

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Prepared by the staff of
National Agricultural Library
Joseph H. Howard, Director

INTRODUCTION

This information package represents an effort on the part of the staff of the National Agricultural Library to assemble a variety of information about an important current topic. The lead essay prepared by a knowledgeable expert in the field discusses in some depth the specific issue.

FROM THE LITERATURE provides a representative sampling of literature available on the subject. Much of these materials were selected from the AGRICOLA database of the National Agricultural Library. An NAL call number is given for titles in the collections of the Library. The Library does not maintain a collection of audiovisual materials in this subject area. Sources are listed from which slide and filmstrips may be acquired.

The listings of **CURRENT RESEARCH** and **DEMONSTRATION PROJECTS** are taken from several databases. CRIS (Current Research Information System) is a computer based information storage and retrieval reporting system for publicly supported agricultural and forestry research in the United States. For further information contact Current Research Information Systems, NAL Building, Beltsville, MD 20705 (telephone 301-344-3850). Descriptions of demonstration projects were provided by the NARS (Narrative Accomplishment Reporting Systems) of the Extension Service, USDA, NAL Building, Beltsville, Md, 20705, telephone (301) 344-3750.

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WOOD AS AN ALTERNATIVE HOME HEATING FUEL

Beginning in the early 1970's, homeowners began returning to wood as a supplemental, emergency, or even as a primary source of heat. Why not burn wood efficiently in a stove, rather than inefficiently in a fireplace? Sellers of wood stoves were unprepared for this onsurge. Manufacturers could not produce enough stoves to meet demand. Hundreds of new wood stove manufacturing companies were started, and imports of wood stoves surged.

Standards and User Information

In the rush to put new products on the market, there was not enough time for the industry to agree upon standards for measuring wood stove efficiency, or even to permit safety testing of all models of wood stoves on the market. Many sellers did not even offer to install stoves, leaving that important responsibility up to the purchaser. In some cases, stoves which had not been tested and labeled for safety were sold to homeowners who could not install them legally, if they wanted to. Some particular housing jurisdictions have restrictive building codes which only permitted use of stoves tested by some recognized laboratories. Sometimes only the test of a particular laboratory (such as Underwriters) were accepted in a given jurisdiction. Few stove manufacturers could afford to go to the trouble of having their product tested by every laboratory whose certification was required in every jurisdiction in that firm's total market area.

In the rush to meet the demands of the market, it is understandable that the concern for safe and efficient use of wood for heat took a back seat to the overriding concern of most users to find a less expensive fuel, and a fuel that would be available in a crisis. This void of information on the part of the user resulted in a concerted effort by the Cooperative Extension Service and others to provide more information. However, good, objective information was not always available. For example, the Department of Energy funded a project in Auburn, Alabama, to test stoves for efficiency, and label them so that consumers could compare the relative efficiency of wood stoves much as they can compare the energy efficiency of air conditioners or refrigerators. Unfortunately, the complications involved in testing wood stoves for efficiency were such that most manufacturers whose products were tested at Auburn chose to <u>not</u> publicize the Auburn test results.

Safety and Efficiency

There is still no uniformly accepted and easily reproducible test for efficiency of woodburning stoves. There are so many difficult-to-control variables that there may never be a completely adequate test for wood stove efficiency. Operator variables are difficult to quantify. In addition, there is considerable variability in the fuel, both with

regard to moisture content and specific gravity. Most efficiency claims used by manufacturers in their promotional materials are peak efficiencies under ideal operating conditions and using excellent fuel. If a typical homeowner purchases a stove having a peak output just equal to the BTU's of heat needed on the coldest day of the year he may be able to operate his stove near or at the efficiency claimed for the stove on that particular day. However, most of the year the homeowner does not need that much heat from the stove.

The efficiency of most stoves falls considerably when the stoves are operated at less than peak output. To compare the cost of heating with wood to the cost of heating with other fuels, a homeowner needs to know the yearround efficiency of the wood stove. But that is nearly impossible to calculate accurately.

Much excellent information is now available to users relative to types and construction of stoves and proper installation. There is still a lack of good information on retrofitting a stove into an existing chimney or into an existing fireplace; best operating procedures; accurate evaluation of fuel savings taking all costs into account; how to determine a size of a unit for a given application; and maintenance, inspection, and cleaning of chimneys. As is typical for any safety education program, users refuse to believe that it will be their house that might burn down because of improper installation, operation, or maintenance of their wood stove. Insurance company statistics not withstanding, most users do not view their own "warm and friendly" stove as a threat to their home and perhaps to their very lives.

Creosote

Creosote accumulation is the major hazard in burning wood for home heating. Creosote is a problem because when it accumulates in a stove pipe, flue, or chimney, it can result in a chimney fire. When creosote catches fire, the heat generated may elevate the temperature of the stove pipe, flue, or chimney far above its safe operating temperature. These unusally high temperatures may in turn ignite combustibles in the home even if they are a "safe" distance from the stove and pipe. The wood frame of the house near the chimney may catch fire. The chimney may be weakened from excessive thermal expansion and overheating of liners. The chimney fire may spread to other structures through airborn particles.

Creosote accumulation is a complex process. Some factors which may lead to excessive creosote accumulation are efficient, "airtight" stoves; long, slow, "cold" burns; and oversized and outside chimneys which overcool the combustion gases, causing them to condense. If wood was burned under completely ideal conditions, all of the

combustible gases would be burned before they left the stove, so there would be no unburned hydrocarbons to accumulate as creosote in the pipe or chimney. But wood is almost never burned under perfect conditions. Some of the gases released from the wood as it is heated within the stove are not burned in the stove because they do not reach a high enough temperature. If these gases exit out the chimney while they are still at temperatures above the condensation point, they escape into the air without causing accumulations inside the chimney or pipe. However, if the smoke (the uncombusted hydrocarbon gases) leaving the chimney is so hot that it is above the condensation point of the unburned gases, then considerable heat is also being lost. From an efficiency standpoint, the exhaust gases should be cool, but that also encourages temperatures below the condensation point and the inevitable creosote accumulation problem.

Much of the recent technology for burning wood efficiently strives to develop systems which will (1) burn as many of the combustible gases as possible while they are within the stove, (2) recover as much of the heat as possible before it leaves the system, and (3) reduce the accumulation of creosote by the exit gases.

One of the most promising alternatives to the creosote problem may be the catalytic combustor. Smoke passes through the openings of the catalytic combustor (somewhat similar to the catalytic combustor in an automobile) which is located within the stove. The presence of the catalyst lowers the ignition temperature of the unburned combustible gases so that they begin to burn within the stove. Once combustion starts within the catalytic combustor, it burns nearly all of the gas which passed through it. This "smoke eater" not only reduces the creosote accumulations, but recovers more usable heat, and reduces the atmospheric pollution from wood stoves. There is, however, some uncertainty about the service life of an individual catalytic combustor. Stoves so equipped are more expensive, and replacement combustors are expensive.

The other alternative is to accept the accumulation of creosote as inevitable, but allow for it by periodic inspection and cleaning, when necessary. If creosote is removed before a large quantity has accumulated, there is obviously less chance for a damaging chimney fire. Some operators purposely burn the stove "hot" for short periods to burn out small quantities of creosote before a large amount has been allowed to accumulate.

Juger, Dyer, Maxwell, and Maples have studied the creosote accumulation process for the Department of Energy. They list the following factors which they say affect creosote formulation:

Species of wood
Geometry of the wood
Moisture content of the wood
Flue gas temperature
Chimney wall temperature
Height of chimney
Roughness of chimney wall
Firing rate
Air-fuel ration
Combustion temperature
Types of stove
Ambient temperature and humidity
Exhaust gas flow rates
Ration of primary to secondary combustion air

These factors add to the complications of the consumer trying to select appropriate wood burning equipment. They are cited to illustrate the complexity of the creosote problem, and to encourage frequent chimney inspection by users <u>in any case</u>.

Wood, properly used, can be an economical and safe source of heat. But its safe use requires more knowledge than just knowing how to turn a thermostat up or down.

The Bottom Line for Me Is Dollars - How Much Money Will I Save?

That all depends. You might not save anything. How much are you paying for fuel now? How much wood would it take to substitute for part or all of the fuel? Are you going to spend enough money to have an efficient woodheating system? Or will a slightly less efficient system (by virtue of its lower cost) be a better alternative for you? For example, one cord of dry, dense, hardwood burned in an efficient woodburning stove can produce as much heat as two hundred gallons of fuel oil. On the other hand, one cord of a light wood, if wet and if burned in an inefficient woodburning stove, may produce less heat than fifty gallons of fuel oil. There are so many variables that it is all but impossible to predict how much money you will save even if you do not place a value on the additional time that it will take to cut your own firewood.

Many users have been able to cut the quantity of alternative fuel needed to heat during a heating season by more than half by installing a woodburning stove. Many have reduced the cost of their alternative fuel by $500 or $1,000 per year through using wood. But that is not all savings because there is an initial investment (which could be $1,000 or $2,000 depending on the kind of unit and whether you have to construct a satisfactory chimney), the cost of the wood, and the value of additional time needed to operate and maintain your wood-burning stove.

How Work Will I Have To Do?

If you pay someone to install your woodburning stove for you, and if you pay a firewood supplier to deliver seasoned firewood stacked where you can get to it easily, and if your stove will hold a fire for a long time so that you don't have to add fuel at frequent intervals, and if you pay a chimney sweep to maintain your chimney for you, you might spend as little as 15 minutes a day actually feeding your stove and hauling out your ashes. On the other hand, if you cut, haul, split, stack, dry, and then restack your own firewood, you will have much more time invested and probably additional equipment such as a trailer or truck, a chain saw, ax, maybe a mechanical wood splitter, perhaps a drying shed, fuel to operate your chain saw and truck, and you will also have the cost of depreciation on your equipment. In this case your wood might be low cost or even free, but if you assign any value to your time, and if you have to purchase considerable equipment in order to make firewood, your costs may be considerably higher. If you have to travel a considerable to get your "free" firewood, the fuel for your truck and the value of your time may end up costing you more than if you had purchased the wood locally.

The Bigger the Stove I Get, The More Heat It Will Produce, So the More Money I Will Save. Right?

Any stove which is large enough to heat an entire home during the coldest days is quite likely to be inefficient during the rest of the heating season. Wood stoves are generally more efficient when operated at near their peak capacity.

If you are totally dependent upon wood as a source of heat, you might be better off with two or more smaller stoves so that you can operate one or more efficiently, depending on how much total heat you need. If you have an alternative backup heating system, you might be better off to purposely select a woodburning stove smaller than your total heating needs on the coldest days. You can then operate your wood burning stove near its capacity most of the season, and depend on your backup system for the additional heat required during the coldest days.

Why Don't I Just Get the Cheapest Stove I Can and Install a Long Stovepipe to Recover the Heat that Would Otherwise Go Up the Chimney?

It is true that additional lengths of stove pipe or a stovepipe heat exchanger (this is a device which fits in place of a length of stovepipe but has a large surface exposed within the smoke path and sometimes a mechanical fan to extract heat from the smoke) can extract additional heat from an inefficient stove. Either of these alternatives may, however, create an ideal situation for creosote to accumulate. Another disadvantage of a very cheap stove is that the air supply to the fire cannot be controlled very accurately because of gaps in the stove, so it will probably not hold a fire very long, and it cannot be operated at a very low output since air gets in irrespective of the draft settings.

What Difference Does It Make If My Stove Is Airtight, and How Do I Tell If It Is?

"Airtight" is a term used to describe stoves which are carefully and purposely constructed to close tolerances, generally with tightfitting, gasketed doors, so that the fire within the stove can be controlled entirely by the draft settings. Air for combustion will be forced to enter the stove only at those points where the designer intended it to enter rather than through some cracks elsewhere. It also means that the draft can be shut down so that the stove will operate at a very low output. By controlling the air, an airtight stove <u>generally</u> results in cooler temperatures for the gases as they leave the stove, which contributes to efficiency, but may also contribute to creosote formation.

Examine the stove carefully. Look for cracks and openings in joints where light shines through. Look for doors that are tightfitting. Use a piece of paper, close the door on it, and try to pull the paper out. If you can pull it out the door is not tightfitting.

Isn't a Stove that Burns Both Wood and Coal Better Than One that Burns One or the Other?

Most woodburning stoves are not designed to burn coal, but there are some which are designed to safely burn both fuels. However, such a design involves compromises which are likely to result in inefficiencies when burning one or the other fuel or then burning both. Wood and coal differ greatly in their burning characteristics. So it is rather unlikely that a stove designed to burn both wood and coal satisfactorily will be as efficient as a stove designed specifically for wood or one designed specifically for coal.

I Need a Big Stove So I can Put Enough Wood in It to Last All Night

The size of the stove is not as big a factor in determining whether it can burn all night as is the construction. Another important factor in sustaining a long burn is the fuel itself. Low density woods like poplar and pine take up more space per pound of wood than high density woods like oak, beech, and maple. Another factor is how much heat is required for the structure overnight. If the house is uninsulated and the weather is severe, the total BTU's required may be in excess of the total BTU's that the firebox could hold if completely filled with high density firewood. In very cold weather, a house may require 50,000 BTU's per hour to heat it adequately. Allowing for some inefficiency, wood can produce about 5,000 BTU's per pound. That means it would require about 10 pounds of wood per hour to heat the house, or about 120 pounds if the house is to be heated for a 12-hour period with one charge of wood. The firebox may not be large enough to hold 120 pounds of wood, and if it is, the stove is more likely to produce 100,000 BTU's for the first several hours, and smaller amounts later.

I Want a Thermostatically Controlled Stove So I Can Load It up and Forget It

Some woodburning stoves are thermostatically controlled. The thermostat adjusts the quantity of air entering through the stove's draft control. When the thermostat indicates that more heat is needed, the draft control opens automatically and the additional air increases the rate of burn which in turn produces more heat. When the room is warm enough, the thermostat closes down the draft to a minimum needed to sustain the combustion. However, a wood stove is not as easily shut down or started up as an oil, gas, or electric furnace. With alternative heating systems, a thermostat shuts the system down completely until more heat is needed. With a woodburning stove, the heat output is reduced when the draft is reduced; the wood continues to burn, but less rapidly. The effect of this off and on cycling upon the stove's efficiency is difficult to predict. The stove may be more efficient part of the time, since it is permitted to operate at near capacity during the time in which the draft is open. But, it may be rather inefficient during the period when the draft is closed down. So the total efficiency over a total burn may be more, or less, than a stove with a manually adjusted setting.

Wood Is Wood, I Always Say. I Just Put It in the Stove and It Burns. What Difference Does It Make?

Woods are quite variable in density, burning characteristics, and moisture content. There is little difference between heating value, pound for pound, between various woods. However, because of the great difference in density between woods, a cord of less dense wood may weigh only one-third as much as a cord of dense wood. The dense cord would have about three times the heating value of the less dense cord. The denser woods tend to burn more slowly and, since they are denser, a given size firebox will hold more pounds of the dense wood than it will hold of the less dense wood.

Moisture in wood reduces heat output from the wood, and affects burning characteristics. Wet wood does not burn as well, and burning wet wood may result in a greater accumulation of creosote than would have occured if the wood was dry. It takes a long time for wood to dry. Airdrying undercover for a season is recommended. Even then, the wood still would contain considerable moisture. An inexpensive solar kiln for further drying firewood has been designed by Eugene Wengert, Extension Specialist, Forestry, Virginia Polytechnic Institute and State University, Blacksburg, VA 24061. The additional heat gained from burning dry wood may justify the expense. However, there is some evidence that burning excessively dry wood may result in more creosote if the air supply to the stove must be excessively restricted in order to reduce the heat output of the stove. This suggests that it might be better (from the standpoint of creosote) to burn somewhat wetter wood when smaller amounts of heat are sufficient.

How Do I Know My Stove Will Be Safe to Operate?

Most stoves, whether tested by recognized laboratories or not, have been designed to perform safely if properly installed and maintained. Most manufacturers provide such information. The information is widely available in numerous publications of Extension Service, building codes, local fire departments, and through chimney sweeps. Perhaps the best assurance that your stove will be safe to operate would be to have it installed by a professional chimney sweep, who will also recommend a schedule for regular maintenance and cleaning. If you have an existing stove and you are uncertain about it, you could also have it cleaned and inspected by a professional chimney sweep who will recommend any changes in the installation of the stove that may be needed to assure that it will continue to operate safely.

How Far Must My Stove Be Located Away from Combustibles?

Information relative to the minimum clearance from combustibles should be provided with every stove. Most building codes require the distances 36", 12", and 18". The 36" refers to the distance from combustibles for a radiant, free-standing stove. The 12" distance refers to the distance from combustibles for a circulating stove (a stove

What If I Don't Want My Stove Sticking Out In the Room that Far?

surrounded by a sheet metal shield in which a forced or natural draft carries the heat from the stove to the room), and the 18" refers to the distance from the stove pipe to combustibles. Safety requires considering unusual as well as normal circumstances, for example, when the stove gets much hotter than normal because the heat-circulating fan fails. That is when adequate clearances are critical.

Minimum clearances can be reduced by providing protection for combustible walls. For example, a 1/4" asbestos millboard, spaced out 1" from the wall, may permit the minimum clearance to be reduced from 36" to 18". The minimum clearance can be reduced even further to 12" by using 28 gauge sheet metal spaced out 1" from the wall. The wall protection must be large enough so the minimum distance to the nearest combustible wall is still 36". Likewise, the distance between the stove pipe and the wall can be reduced from 18" to 12" using the asbestos millboard and to 9" using the 28 gauge sheetmetal. Note in each case that the wall protection must be spaced out from the wall being protected. No reduction in minimum clearances is permitted for a combustible wall which is "protected by" a noncombustible material placed directly on the combustible wall. The reason for this is that the heat would be conducted directly through the noncombustible material to the combustible wall, which means in effect it provides no protection.

If you intend to use wall protection, be sure to select acceptable spacers; it obviously does not protect the wall if combustible spacers are in direct contact with the wall protection material. The heat would be conducted directly to spacers which in effect means it provides no protection.

Is My Old Chimney Satisfactory?

In general, unlined chimneys are never acceptable. Lined chimneys <u>may be</u> acceptable if carefully inspected to determine that the lining is intact throughout the chimney. Even a lined chimney, in good condition, may not be acceptable if the chimney is too large for the stove being installed. A chimney that is too large allows the hot gases which exit from the stove to cool excessively before leaving the chimney, which creates an ideal situation for creosote to accumulate. Most codes do not permit more than one connection to an existing chimney. So even though a chimney may be large enough for more than one stove adding an additional stove or using a larger stove than necessary is not a good solution to utilizing an oversized chimney.

One possibility for using an unlined chimney or a lined chimney that is too large, is to install a stainless steel chimney pipe of the proper size inside of the existing chimney. Follow instructions carefully to avoid creating an additional fire hazard in such an installation.

Should I Build a New Chimney?

If you want to install a wood-burning stove but you do not have a satisfactory chimney to use, your only alternative is to install a new chimney. Sometimes the cost of a new chimney may be more than the cost of the stove. One alternative which has been very popular (but also potentially very hazardous) is connecting a woodburning stove to an existing fireplace, or installing a fireplace insert. Another popular alternative is to install a metal, prefabricated chimney rather than a masonry chimney. A metal, prefabricated chimney does not require the extensive foundation that would be required for a masonry chimney and there is often greater flexibility with regard to where a prefabricated chimney could be located. For example, one could locate a metal chimney almost any place in the house where it is convenient to pass it through the floors and ceiling simply, by cutting holes for it (properly insulated, of course). A masonry chimney is not that easily added to the structure of the house. There have been some particular questions about safety of metal chimneys, particularly if both coal and wood are burned. The sulpher in coal may cause premature deterioration of the metal.

Installing a wood stove or fireplace insert in an existing fireplace is a popular alternative simply because this chimney often exists. Perhaps the best procedure is to install the correct size stainless steel pipe with direct connection from the stove all the way out the chimney. This is not always possible, particularly where the original fireplace damper is a narrow slit rather than a rectangular opening. Some special devices for connections of this kind are now being manufactured and some can be custom made (which may be rather expensive). If a direct connection is not possible, it is critical that the chimney be inspected frequently.

How Do I Know When My Chimney Needs Cleaning?

A direct connection to an inside-the-chimney stainless steel pipe is much more difficult to make with an insert than with a stove. With or without a pipe inside-the-chimney, adequate provision must be made for inspection and cleaning of inserts. Some inserts are on rollers, which encourages inspection since it is much easier to remove them.

Frequent inspection is the only reliable way to determine when a chimney needs cleaning. The entire length of the chimney and the stovepipe must be inspected, since creosote could form at any point. More frequent inspection in fall

How Can I Operate My Wood Burning Stove to Keep Down Creosote?

and spring may be necessary because during this period wood stoves are often operated at less than full output, which contributes to creosote formation. An inspection schedule determined during the prime heating season may not be valid for these periods.

There are no general guidelines as to how frequently a chimney needs to be cleaned. So much depends on the installation and the operation.

Some suggestions are: use dry wood, build small fires, leave the door open a crack after adding new fuel to allow the new fuel to ignite before closing the door, and use your alternative source of heat rather than your wood stove during the early fall and late spring when your wood stove would have to operate at low heat output.

PUTTING IT ALL TOGETHER

Some Aspects of the Fuel Itself

The amount of heat that a given volume of wood will produce is much more variable than the amount of heat that a given weight will produce. Yet most firewood is still sold by the cord, which is a measure of volume rather than of weight. The cord doesn't measure the volume of the actual wood, rather it measures the volume of stacked wood which would occupy a space 4' high, 4' wide and 8' long. This space is equal to 128 cubic feet. But the actual volume of wood contained in such a space, allowing for the spaces in between the individual pieces, is about 80 cubic feet. The actual weight of a cord of wood can vary from less than a ton for low density, dry wood to nearly 3 tons for high density, wet wood. The fuel value can vary from less than 15 million BTU's to over 30 million BTU's.

A cord of the best firewood then, can contain as many BTU's as 220 gallons of fuel oil. However, since oil furnaces are generally more efficient than woodburning stoves, the actual substitution rate is about 175 to 200 gallons of fuel oil for 1 cord of oak or hickory firewood or about 1.2 tons of coal per cord. If the firewood is only partially air dried, the additional moisture reduces the fuel value by about 5%. On the other hand, if the fuel is dried below 20% moisture, there is an additional gain in fuel value.

Since a cord of good firewood can weigh 2 tons or more, it goes without saying that transporting firewood long distances is expensive. A small truck or a trailer cannot hold enough firewood to make it worthwhile, if all costs are considered. However, if gathering and hauling firewood is a recreational pursuit, then it is a different situation. "Free" firewood may not be free at all when all costs are taken into consideration.

There are unseen costs or benefits relative to the effect upon forests of the removal of trees for firewood. In most forest stands certain trees can be profitably removed to provide future benefits to the forest stand in addition to using these trees for firewood. The benefits to the future timber stand may more than offset the costs of harvesting the firewood. But if the wrong trees are selected, the firewood operation may reduce the future value of the timber stand. Reduction in the future value of the forest should be considered as an unseen but added cost to the firewood operation. In other words, "free" firewood may not really be free if all other costs and benefits are taken into consideration. On the other hand, a forest owner might actually pay to have firewood removed if it benefits the future forestland.

Selecting a System

Many wood-be woodburners do not want to give up entirely the convenience of an automatic system, whether as a principal system or as a backup system. Often an existing system such as a gas or oil furnance can be retained, as is, to operate automatically when the house is vacant, or when the wood stove can not carry the entire heating load. The thermostat of an automatic system can be set low enough so that it never comes on unless the heat produced by the wood-heating stove is not sufficient.

Sometimes the existing automatic furnace can be connected to an add-on wood heating furnace in which the heat from the wood furnace is distributed through the same heating ducts as the heat from the automatic furnace. A supplemental wood furnace is best located near the central heating unit and separate ducts are connected into the cold air return plenum and the heating plenum. The add-on wood heating furnace supplies heat when it is operating and when it is not adequate or not operating at all, the regular automatic furnace takes over.

If a new house will be heated primarily with wood, or if an existing heating system needs to be replaced anyway, then there are some other alternatives which should be considered. Dual fuel furnaces are available which burn wood and then automatically switch to an alternative fuel when the wood heat is not sufficient or when wood is not being burned. These can either be hot air systems or boilers. With such a system, a homeowner can burn wood whenever convenient, and when not convenient, the automatic heating system will take over automatically.

A central woodburning furnace can be used as the main source of heat with some other automatic backup system, such as an electric baseboard system. Or, a woodburning furnace with a central heat pump can be combined using the same duct system to both heat and cool.

Alternative Central Wood Heating Systems

Another alternative central wood heating system utilizes the very high efficiency of "turbulent burning" systems. Individual charges of wood are burned rapidly and at very high temperatures. The heat is stored in water or in rock to be released as needed into the home. When additional heat is needed, another charge of wood is burned. Since this system requires heat storage anyway, it is possible to combine it with a solar heating system. Solar heat would also recharge the storage, in which case the wood furnace would only be needed when the solar heat was inadequate to recharge the storage.

Some systems attempt to improve the efficiency of a fireplace. These involve various methods of either extracting the heat from the fireplace through tubular grates and blowers or preventing heat loss from the

fireplace through glass doors. If a new fireplace is being constructed, there are heating units which can be built in which are much more efficient than conventional fireplaces.

Sizing a System

After a user selected the type of system most appropriate to his wood heating needs, the next step is to estimate the size of unit needed to meet these needs. A common mistake is to select a unit which is too large, on the basis that a large unit can always be operated at a lower capacity, whereas as small unit can never be operated above its capacity. However, if an adequate backup system is available, it might be much better to depend on the backup system for additional heat for those very few cold days of the year rather than design the entire woodburning system to supply this maximum and then operate the woodburning system at less than the most efficient level for the rest of the year.

Selecting a Specific Unit

Once the specific kind of wood heater and the approximate size are selected, the user is still faced with a bewildering assortment of individual units of all shapes and configurations. Considerable product information is available from the manufacturers, but there are so many different manufacturers that a single seller is unlikely to carry a very complete assortment of all available products.

FROM THE LITERATURE

This section provides readers with a representative sampling of literature available on wood as an alternative home heating fuel.

Major Books and Articles

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Burning Fuel Wood: Does it Pay? T. F. Weaver and E. Hutton. Kingston, R.I., University. Extension Service. (1981?) 6 p. (Mimeo Circ. 183).
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Heating Domestic Water with Wood. S. Denner and E. Valbert. Pullman, Wash., Washington State University, Cooperative Extension Service, Aug. 1981. 2 p. (Extension Bulletin 0947).
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Installation of Wood Stoves in Fireplaces (Safety Aspects). T. J. Karsky. Moscow, Idaho, Idaho University, Cooperative Extension Service, Jan. 1980. 3 p. (Current Information Series 520).
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Building Your Own Wood Stove. R. E. Taylor. Moscow, Idaho, University of Idaho, Cooperative Extension Service, July 1979. 3 p. (Current Information Series 486).
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Wood for Home Heating:

Chimneys--Problems and Solutions. R. K. Jorstad. Madison, Wis., University of Wisconsin Extension. Jan. 1980. 4 p. (Publication - Cooperative Extension Programs G3048).
(NAL Call No.: S544.3.W6W53)

Cleaning Stove Pipes and Chimneys. R. K. Jorstad. Madison, Wis., University of Wisconsin-Extension. July 1979. 4 p. (Publication Cooperative Extension Programs G3011).
(NAL Call No.: S544.3.W6W53)

The Creosote Problem and How to Reduce It. R. K. Jorstad. Slightly rev. Madison, Wis., University of Wisconsin Exten. June 1979. 4 p. (Publication - Cooperative Extension Programs G2984).
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Safety and Wood Heating Systems: How to Install a Wood Burning System Correctly and Safely. R. Vacca and J. Jenkins. Madison, Wis., University of Wisconsin, Extension. Oct. 1979. 8 p. (Publication - Cooperative Extension Programs G2936).
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Wood Heat. R. C. Parker. State College Miss. Mississippi State University, Cooperative Extension Service, (Publication 1215).
(NAL Call No. 275.29 M68EXT)

Wood Stove Selection. W. E. Matson. Pullman, Wash., Washington State University. Cooperative Extension Service. June 1980. (Bulletin 0725).
(NAL Call No.: 275.29W27P)

Wood Stoves, Furnances and Fireplaces. P. H. Wray. Ames, Iowa., Iowa State University, Cooperative Extension Service, Sept. 1979. 6 p. (PM 802).
(NAL Call No.: 275.29 I09PA)

SLIDE SETS AND FILMS

The Gathering and Storage of Firewood. $35
62 slides. 14:40 min. (Shows the beginning woodcutter how and where to get firewood and illustrates proper woodcutting, chain saw and storage practices.)

Selecting Your Wood Burner. 78 slides. $35
19:50 min. (Discusses different types of wood burners available and lists factors to consider when installing a wood stove in your home.)

Wood Stove Installation. 79 slides. $35
26 min. (Shows installation procedures and discusses other factors to consider when installing a wood stove in your home.)

Make Your Fireplace More Efficient. $25
49 slides. 14 min. (Discusses ways to improve efficiency of existing fireplaces suggest efficiency factors to look for when you select a new fireplace.)

Chimney Cleaning. 37 slides. 12:35 min. $25
Discusses the cause of creosote buildup, shows how to clean the chimney and tells what do in case of a chimney fire.)

These 5 slide sets may be purchased at the prices listed from the Department of Agricultural Information, College of Agriculture, University of Idaho, Moscow, Idaho 83843.

Firewood - the Other Energy Crisis [Motion Picture] United Nations Environment Programme; made by Dick Young Productions. New York, Modern Talking Picture Service, 1977. 1 reel, 10 min; 16 mm.

Home Heating with Wood [Motion Picture] New York State College of Agriculture and Life Sciences; made by Motion Picture Center, Cornell University. Ithaca, New York; The Center, 1979. 1 reel, 23 min. sd, col.; 16 mm.

NR227 COMMUNITY AND RURAL DEVELOPMENT - WOODBURNER SAFETY, ENERGY CONSERVATION-ALABAMA

Safety in heating homes with wood has become a very important concern in Alabama in recent years. In 1982 woodburner-related home fires resulted in approximately 13 percent of all fire deaths in Alabama. Three publications were prepared for distribution throughout all the counties to help inform people about safety with woodburners. The subjects covered were selection of woodburners; safety in installation and operation and maintenance of woodburners.
In addition to the publications and as promotional efforts for the subject; the media was used in many parts of the state to make people aware of the problem and to inform them as to where they could get helpful information. Workshops or Woodburning Safety meetings are held in counties upon request and woodburner dealers are encouraged to participate.
The efforts in this area are made under the Farm Safety Program in Alabama. Assistance in gaining knowledge about woodburners was obtained from the Auburn University Woodburning Laboratory, Extension publications from other states and various research reports.
Over 12,000 series of publications were received by individuals throughout Alabama. At least six (6) community meetings were held on Woodburner Safety with a total of approximately 120 persons in attendence. One television interview was held and a radio program was developed and distributed to about 45 local stations throughout the state.
Future efforts to inform citizens of Alabama of safety in heating homes will include small, portable space heaters of various types in addition to woodburners as topics of education. Rural and urban homeowners need to be informed of heating safety as home heating costs continue to rise.
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4H1 4-H ENERGY CONSERVATION, WOOD, CONSUMER SAFETY - ALABAMA

From 1980-81 deaths related to woodburners rose 33% in Alabama. As more people converted to use of woodburners to save energy costs; there was greater need to educate young people to safe use of fireplaces and stoves. Alabama 4-H initiated a program on saving energy safely with woodburning stoves and fireplaces.
120 agents were trained on how to use the materials. The program taught 10 steps to safety with woodburners and an activity and record sheet encouraged youth to practice safe habits; perform community service and share knowledge. November was declared statewide 4-H energy action month.
A committee of representatives from energy related industry and the Extension service steered the program. The program had support of Alabama Power. The State Forestry Commission and National Tree Laboratory supplied 30,000 packets of pine tree seeds; valued at $331.60; which were distributed by agents to present as incentive awards. Quantities of leaflets from the American Wood Council, State Farm Insurance, Aetna Life and Casualty, and Insurance Bureau of Canada were obtained for agent's information.

The program was delivered to 70,000 4-H'ers pges 9-19 by 99 agents. Of the 52,000 junior 4-H'ers participating, 11% completed an energy action survey that measured practices changed. Six counties held energy exhibits or contests; 14 counties made posters; 33 (of 67) counties taped 115 energy radio spots; 23 counties wrote energy newspaper articles; 10 counties used professional resource people in programs. As a result of an article about the program in National 4-H News, 7 to 10 other states have contacted Alabama about the program materials.
The 4-H Energy Action Program received an award in the Youth Program Division of the 1981 Alabama Community Awards Program given by the Alabama Environmental Quality Association. County agents will continue to present the program each year.
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NR323 HEATING WITH WOOD - ILLINOIS

Illinois has developed a comprehensive program on heating the home with wood. The Extension Service assists homeowners in the selection and proper use of wood heating devices, and how they save conventional fuel by switching to wood.
State Extension specialists and county advisers offer instruction to homeowners, small businessmen, fire marshalls, building inspectors, insurance agents, wood-stove dealers, and local Homemakers Extension Federation leaders through workshop sessions that include the effectiveness of different types of wood heating systems for the home, sizing the wood device to the home, proper installation techniques, safe use, and the economics of wood as an alternative heat source.
A self-teaching slide set and a resource packet is available to county offices on the items listed above.
By the end of fiscal year 1982, the program was presented in 64 of the 102 counties in Illinois. Over 2,300 people participated and benefited from the information presented. Many workshop participants indicated the program helped them decide on the correct wood heating system to install in their home. Dealers encouraged their clients to attend one of the programs nearby.
A new program on Wood Heat Safety will be developed. Homeowners must be aware of potential dangers associated with improper installation and use of wood heaters. It is estimated over 85 percent of all fires attributed to wood systems result from improper installation, misuse and neglected maintenance.
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HOME HEATING WITH WOOD IN NORTH CAROLINA NR60

The rapid increase in oil prices caused by the 1974 oil embargo created a need for homeowners to look for alternative fuels for heating their homes. The vast amount of timber resources throughout the State; its availability; the fact that wood is a renewable resource; and its heating value being lower in cost compared to fossil fuels; made burning wood fuel for heat very popular. There are many persons who were not familiar with wood heating and wood heating systems. This fact created a need for educational programs and information on the subject.

An in-service training program attended by fifty Extension Agents responsible for wood heating was given. The audio-visual programs (6); publications (6); and Ext. Teletip messages (6) available for their program use were demonstrated. A "model" program format of topics and resouce persons was described. This included a forester to tell where firewood may be obtained; a person to explain how to select and install a woodstove; a fire department representative to tell about the precautions to take when burning wood; a chimney sweep to tell why it is necessary to clean the chimney and wood heating system; and an insurance agent to tell what insurance premium changes would occur if a wood heater is installed.

Over 75 of the 100 counties have held a wood heating program during the past three years. The attendance at these meetings; combined with the dozen or so county fairs; including the N.C. State Fair; has reached at least 25,000 persons.

The demand for selecting and installing wood heaters has decreased in the past two years. There is now a need to emphasize burning wood safely. A residential wood heating safety committee comprised of Agricultural Extension Agents; chimney sweeps; fire department personnel; insurance agents; woodstove distributors and retailers and building code inspectors are jointly cooperating on a statewide mass media campaign to promote burning wood safely.

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HOME WOOD HEATING SAFETY AND EFFICIENCY IN MICHIGAN NR49

A state wide program to increase the efficiency and safety in using wood as a fuel for home heating was carried out. A mobile wood heat safety display spent the summer and fall touring the County Fairs of Northern Michigan and the U.P. State Fair. The same display was used at major state wide extension events such as Farmers Week. Travel costs for the display have been supported by a grant from a large insurance company.

Thousands of publications in a home wood heat series have been handed out and some have required two and three reprints. The extension wood heat publications have been adopted by Michigan building code officials and fire safety inspection for consumer information. The use of wood as a fuel in Michigan is greater than pulpwood used in 1982; and as energy costs increase more home owners are turning to this fuel.

A number of county meetings emphasizing the safety aspect and heating efficiency were held and will be reported separately. Program; resource people and materials were supplied by specialists. Woodlot management was integrated as a subject at many sessions but is reported under another narrative.

FOR THE FUTURE WOOD HAS AND WILL INCREASE AS AN ALTERNATIVE ENERGY SOURCE WITH NEW AND MORE EFFICIENT METHODS OF HANDLING AND BURNING FOR HOME USE. THE NUMBER OF FATALITIES HELD CONSTANT AT 19 DUE TO WOOD HEATING FIRES IN MICHIGAN LAST YEAR. THIS IS TOO HIGH A LOSS; BUT CONSIDERING A DOUBLING OF USE OF WOOD AS A HEATING FUEL WITH MANY NOVICES USING WOOD IT HAS SHOWN THE VALUE OF THE SAFETY EFFORT AND NEW STATISTICS SHOULD REFLECT THIS. INSURANCE RATES FOR HOMES HAVE NOT INCREASED AND THE SAFETY PROGRAMS SHOULD BE GIVEN CREDIT SINCE OTHER STATES HAVE HAD INCREASES. THE PROGRAM THUS HAS SHOWN HOME OWNERS HOW TO SAFELY USE WOOD HEAT; KEEPING THE INSURANCE RATES LOWER THAN OTHER STATES. IT HAS ALSO SHOWN THE CONSUMERS HOW TO SAVE MONEY IN USING WOOD AS A FUEL MORE EFFICIENTLY. THE PROGRAM SHOULD BE CONTINUED; KEEPING UPDATED ON NEW HEATING DEVICES AND METHODS; AND MONITORING THE SAFE USE.

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AG157 MISSOURI - USING WOOD FOR FUEL

INCREASING FUEL COSTS FOR HOME HEATING HAS CAUSED MANY HOMEOWNERS TO CONSIDER ALTERNATE OR SUBSTITUTE HEATING FUELS WHICH MIGHT BE CHEAPER IN PRICE. WOOD IS CONSIDERED TO BE AN EXCELLENT ALTERNATE HEATING FUEL. EASE OF SECURING WOOD MAKES THIS ALTERNATIVE MORE ATTRACTIVE TO RURAL HOMEOWNERS. THE DECISION OF USING WOOD AS AN ALTERNATE FUEL MUST BE AN ECONOMIC ONE. OTHER FACTORS INVOLVED IN THE DECISION INCLUDE CONVENIENCE; SECURING WOOD BURNING EQUIPMENT AND CHIMNEY; AND SAFETY.

TO ASSIST HOMEOWNERS TO SAFELY INSTALL AND OPERATE THESE SOLID FUEL HEATING SYSTEMS; THE MISSOURI EXTENSION STAFF DEVELOPED A STATEWIDE EDUCATIONAL PROGRAM. THE MAIN OBJECTIVE OF THE PROGRAM WAS FOR HOMEOWNERS TO LEARN TO MAKE SOUND DECISIONS CONCERNING THE SELECTION; INSTALLATION AND OPERATION OF WOOD BURNING STOVES.

EXAMPLES OF VERY EFFECTIVE MISSOURI PROGRAM DURING THE PAST ARE:

THE MISSOURI VALLEY AREA EXTENSION STAFF CONDUCTED A SERIES OF SEVEN WOOD HEAT MEETING FOR 105 AREA HOMEOWNERS. "ELEVEN OF THESE HOMEOWNERS HAVE PURCHASED AND INSTALLED SOME TYPE OF WOOD BURNING EQUIPMENT. TWO FAMILIES HAVE REPORTED THAT THE COST FOR HEATING FUELS HAVE BEEN REDUCED BY AS MUCH AS 60 PERCENT. THIS REDUCTION IN COST IS QUIET VARIABLE AND IS DEPENDENT ON THE COST OF SECURING WOOD AND THE PERCENTAGE OF FUEL SUBSTITUTION THAT TAKES PLACE."

THE MERAMEC AREA EXTENSION STAFF HELD WOOD HEAT SAFETY MEETINGS IN FIVE COUNTIES. "THESE MEETINGS WERE ATTENDED BY 100 FAMILY REPRESENTATIVES INCLUDING 20 OEO OUTREACH WORKERS. THE OUTREACH WORKERS THEN EXTENDED THE EFFORT BY WORKING WITH LOW INCOME AND ELDERLY FAMILIES TO PROVIDE THEM WITH ENERGY EDUCATION AND SAFETY INFORMATION."

IN THE MARK TWAIN AREA; "A PROGRAM; DEVELOPED BY THE STATE SAFETY SPECIALIST; WAS PRESENTED TO THE PUBLIC AT SEVEN MEETINGS AND TO FIVE HOMEMAKERS CLUBS PLUS ONE COUNTY HOMEMAKERS SAFETY COUNCIL IN A FOUR COUNTY AREA. TWO HUNDRED TWENTY-ONE PEOPLE PARTICIPATED IN THESE SEMINARS. THE PEOPLE WERE OF BOTH RURAL AND URBAN BACKGROUNDS. WOODSTOVE SAFETY WAS THE THEME OF THE ENERGY FAIR BOOTH HELD AT THE MOBERLY AUDITORIUM. A GROUP OF 350 PEOPLE ATTENDED. OF THESE; TEN WERE BLACKS."

AS THE COST OF CONVENTINAL FUEL SOURCES CONTINUE TO INCREASE, MORE HOMEOWNERS WILL BE LOOKING TO WOOD AS A CHEAPER HEATING SOURCE. THIS WILL REQUIRE AN ON-GOING EDUCATIONAL PROGRAM TO ASSIST HOMEOWNERS TO SELECT, INSTALL AND OPERATE THESE SYSTEMS IN A SAFE AND EFFICIENT MANNER.

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RESIDENTIAL WOOD HEATING IN MARYLAND NR24

THERE ARE 1.5 MILLION HOUSEHOLDS IN MARYLAND. APPROXIMATELY 28% OF ALL HOUSEHOLDS (400,000) USE WOOD AS A METHOD OF REDUCING ENERGY COSTS. IN RURAL AREAS OF MARYLAND, OVER 175,000 HOUSEHOLDS USE WOOD AS THE MAJOR HEAT SOURCE. SERIOUS SAFETY PROBLEMS CAN DEVELOP IF CAREFUL ATTENTION IS NOT MADE TO THE SELECTION, INSTALLATION, OPERATION AND MAINTENENACE OF THE WOOD HEATING SYSTEM.

IN 1970, THE MARYLAND COOPERATIVE EXTENSION SERVICE (MCES) BEGAN CONDUCTING A STATEWIDE PROGRAM (23 COUNTIES) ON RESIDENTIAL WOODBURNING SYSTEMS. THE COMPREHENSIVE OUTREACH PROGRAM COVERED ALL ASPECTS OF SOLID FUEL SYSTEMS. THE EMPHASIS OF THE PROGRAM WAS TO TRANSFER THE NECESSARY KNOWLEDGE NEEDED TO BURN WOOD SAFELY AND EFFICIENTLY.

EXTENSION (MCES) HAS BEEN WORKING CLOSELY WITH FIRE DEPARMENT PERSONNEL, BUILDING CODE OFFICIALS, MARYLAND FOREST SERVICE PERSONNEL, AND WOOD STOVE DEALERS TO CARRY OUT THE PROGRAM. MCES COUNTY FACULTY HAVE BEEN INSTRUMENTAL IN HELPING DEVELOP AND COORDINATE LOCAL PROGRAM THRUSTS. SINCE 1979, 91 WOOD HEATING SEMINARS HAVE BEEN HELD FOR 7,000 MARYLANDERS. SIX IN-SERVICE TRAINING WORKSHOPS WERE HELD FOR OVER 700 FIRE SAFETY PERSONNEL AND 60 MCES FACULTY MEMBERS. APPROXIMATELY 64,000 COPIES OF WOOD HEATING BULLETINS HAVE BEEN DISTRIBUTED. WITH FUNDS FROM THE MARYLAND STATE ENERGY OFFICE, THE PROGRAM WAS ALSO ABLE TO UTILIZE A VARIETY OF DELIVERY METHODS, INCLUDING FOUR TELEVISION PROGRAMS, TEN RADIO TAPES, TWO VIDEOTAPES, SIX CANNED SLIDE PROGRAMS, 40 NEWSPAPER ARTICLES, AND 20 NEWSLETTER ITEMS.

EVALUATION FORMS WERE DEVELOPED AND DISTRIBUTED AT ALL PUBLIC MEETINGS AND THE GENERAL COMMENTS HAVE BEEN MORE THAN FAVORABLE. OVER 90 PERCENT OF THE HOMEOWNERS FOUND THE INFORMATION HELPFUL IN ANSWERING THEIR QUESTIONS. THE MOST COMMON COMMENTS WERE THAT THE MEETINGS WERE TOO SHORT (90 MINUTES) TO COVER THE SUBJECT MATTER AND THE MEETINGS SHOULD BE MORE TECHNICALLY ORIENTED.

THE WOOD HEARING PROGRAM WAS ELIMINATED FROM MCES'S CONTRACT WITH THE MARYLAND STATE ENERGY OFFICE IN FY82.

IT IS ANTICIPATED THAT THE PROGRAM WILL BE TERMINATED IN FY83.

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WOOD AS AN ALTERNATIVE FUEL - PENNSYLVANIA NR79

Because the improper installation and operation of wood-burning stoves has resulted in home fire losses of $2.65 million in Pennsylvania, Cooperative Extension has conducted informative and training safety programs in 62 of Pennsylvania's 67 counties.
The major emphasis has been toward rural clientele when code restriction on instrelation procedures is lacking. The effort has been conducted through local civic and fire companies who co-sponsor the programs as a public service. Training programs have also been conducted for mutual inservice personnel who have responsibility for policyholder home inspections.
Mutual companies report their losses to be increasing in uninspected homes but in those homes that have been inspected and corrections made, fire losses are running 52% lower than average. The average loss in inspected dwellings averages less than $75 versus uninspected dwelling losses averaging $5,800.
Training is continuing for code enforcement, fire company, and insurance company personnel as well as for the general public using a four-part slide presentation and a revised fuelwood burning publication. County Extension staff have been provided instructional aids and are now in a position to conduct local programs.
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NR1053 WOOD AS AN ALTERNATIVE FUEL - WISCONSIN

Development of information about wood as a home fuel for woodland and homeowners. Factual material and demonstrations to indicate where and how to obtain fuelwood while conserving forest resources; and how to efficiently burn fuelwood.
This program is a continuation of the special two-year project funded by the Department of Energy. A series of 11 Wood For Home Heating Fact Sheets; a wood heat exhibit and a slide/tape program were produced and distributed to county Extension offices. The Fact Sheet series is currently distributed also by the Wisconsin Department of State Energy.
Six Wood For Fuel meetings were held in the State for woodland and homeowners. Over 200,000 Fact Sheets were distributed through University Extension.
Woodland and homeowners who obtained the fact sheets, viewed the exhibits or attended the meetings learned how to harvest and burn woodfuel more safely and efficiently.
Continuation of an effective programming effort in wood as an alternative fuel will require at least a 1/2 man-year of specialist time. A full-time wood heat specialist was available during the special project period.
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NR779 WOOD - BURNING HEATER PROGRAM - TEXAS

Two wood-burning heater programs were conducted in October. Attending were 26 persons. One home owner will save about $75. - $100. per month in home heating by installing an air-tight wood heater.
A similar "wood-heater" program was presented by the County Extension Agent to the Normangee Chamber of Commerce.
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WOOD ENERGY - NEBRASKA NR52

Increasing costs of fossil fuels, the financial crunch of families because of the economy and a pessimistic outlook has renewed an interest in the use of wood as a heating fuel. An Institute of Agriculture and Natural Resources Task Force in 1980-1982 developed publications on the economics, feasibility, selection and harvesting firewood, developing plantations and the selection and installation and safety of wood burning stoves. Goals are to provide a positive economic benefit for homeowners and woodland owners, reduce the dependence on fossil fuels and improve native woodlands by proper firewood harvesting.
Five years ago there was little interest in firewood in Nebraska. Today there is a great interest that is still increasing. During 1980 - 1981 there was a booming interest and in 1982 based on inquiry to extension offices the interest has increased at least 10% in 1982 over 1981.
When people express interest in planting trees or come in to order trees foresters and County Extension Agents are promoting the concept of developing firewood plantations or including firewood considerations as part of tree plantings for other purposes. Firewood publications were high on demand at Forestry Field Days, at Tractor Days and the Grand Island Farm Fair, which combined attracted an estimated 100,000 people.
In Thayer County an Agnet Computer program calculated the amount of wood needed and money saved using wood for heat. Each individual and home has different requirements. Of those using the program potential savings ranged from no savings to $1200 per heating season. Many cities are selling firewood from tree removal programs that used to be hauled to a land fill. Firewood vendors are increasing and many report they are selling as much as they can handle. Removal of undesirable trees from woodlots for firewood improve the woodlot and meet an economic and energy need.
Nebraska's woodlands are decreasing 1% per year and only 2% of the land area was forested 20 years ago. Increased tree planting, a moratorium on land clearing and thinning woodlots by good management can meet Nebraska's wood energy needs. The past year has seen an increase in tree thefts for firewood including cutting public trees in our cities. Education to leave desirable trees, remove undesirable trees and plant and manage trees for firewood should be an ongoing program. Firewood plantation research is needed on species selection, arrangement and harvesting methods for different soil and climate situations.
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NR781 WOOD-FOR-ENERGY IN TEXAS

THE EXTENSION FORESTRY PROGRAM PIONEERED A WOOD-FOR-ENERGY PROGRAM IN 1980 TO HELP HOMEOWNERS ANSWER THREE IMPORTANT QUESTIONS: WHEN DOES IT PAY TO BURN WOOD? HOW CAN IT BE DONE SAFELY? HOW DOES ONE MAINTAIN A FUELWOOD SUPPLY? THIS PROGRAM IS STATEWIDE AND IS PARTICULARLY SUITED TO LOW-INCOME HOMEOWNERS WHO NEED TO DRASTICALLY CUT HEATING COSTS. MANY RURAL HOMEOWNERS HAVE THEIR OWN FUEL-WOOD SUPPLY; ALLOWING MORE THAN A 50 PERCENT REDUCTION IN CURRENT HEATING COSTS.

TEN CLINICS; ONE TV PROGRAM; 4 RADIO TAPES; 3 NEWS RELEASES AND TWO PUBLICATIONS MADE UP THIS YEAR'S PROGRAM EFFORTS. THE 256 PEOPLE WHO PARTICIPATED IN EDUCATIONAL CLINICS HAVE LEARNED THAT BURNING WOOD CAN REDUCE HOME HEATING COSTS BY 50 PERCENT OR MORE; THE ECONOMIC VALUE OF USING AN AIR-TIGHT STOVE AND THE IMPORTANCE OF USING SEASONED HIGH-DENSITY FUELWOOD. THEY ALSO HAVE FACTS ON HOW TO INSTALL A STOVE TO MEET NATIONAL FIRE SAFETY STANDARDS AND HOW TO CONTROL CREOSOTE.

THE DEMAND FOR PUBLICATIONS INDICATES THE VALUE OF THIS PROGRAM; WITH OVER 20,000 DISTRIBUTED IN A TWO YEAR PERIOD.

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